STD & SPEC 3.05

SILT FENCE

SF

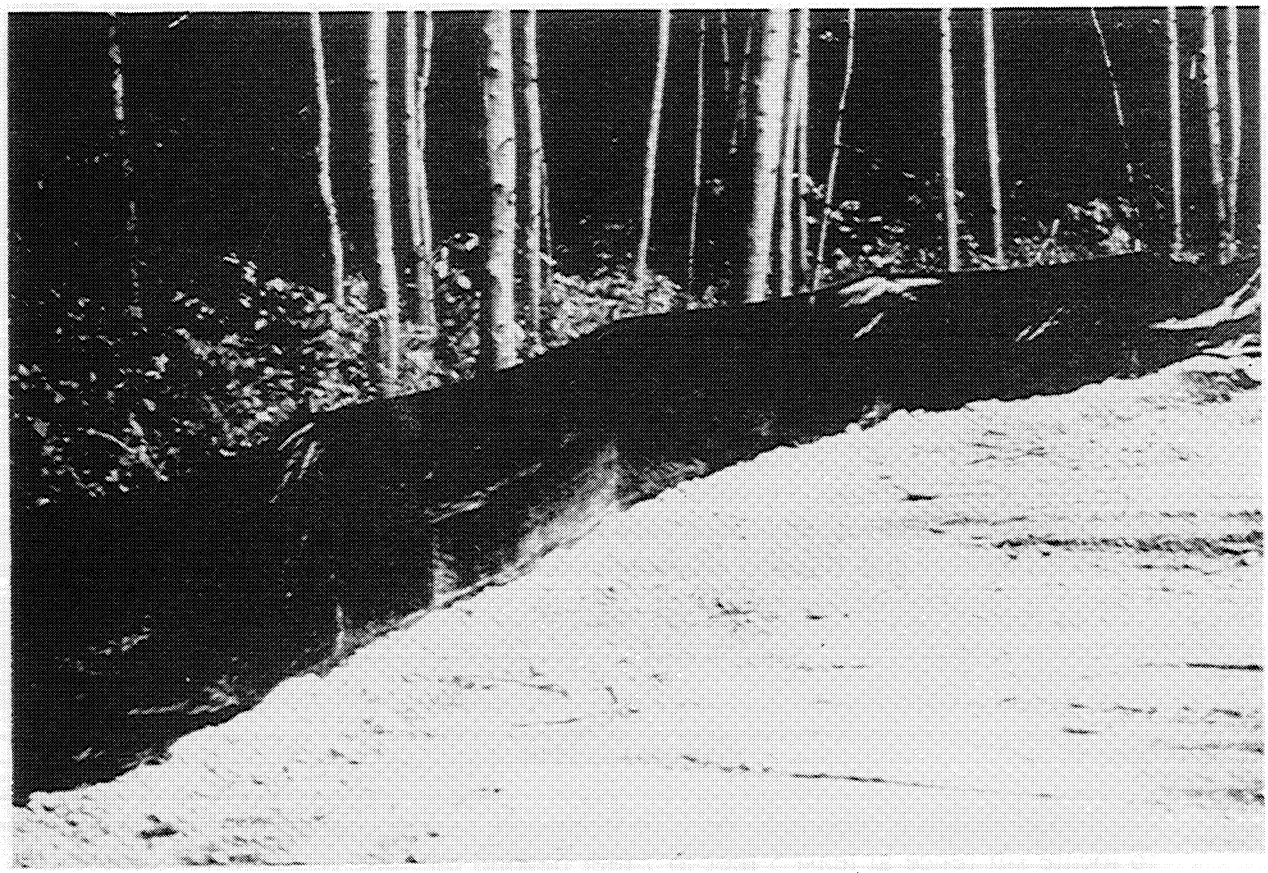
Definition

A temporary sediment barrier consisting of a synthetic filter fabric stretched across and attached to supporting posts and entrenched.

Purposes

1. To intercept and detain small amounts of sediment from disturbed areas during construction operations in order to prevent sediment from leaving the site.

2. To decrease the velocity of sheet flows and low-to-moderate level channel flows.



Conditions Where Practice Applies

1. Below disturbed areas where erosion would occur in the form of sheet and rill erosion.

2. Where the size of the drainage area is no more than one quarter acre per 100 feet of silt fence length; the maximum slope length behind the barrier is 100 feet; and the maximum gradient behind the barrier is 50 percent (2:1).

3. In minor swales or ditch lines where the maximum contributing drainage area is no greater than 1 acre and flow is no greater than 1 cfs.

4. Silt fence will not be used in areas where rock or some other hard surface prevents the full and uniform depth anchoring of the barrier.

Planning Considerations

Laboratory work at the Virginia Highway and Transportation Research Council (VHTRC) has shown that silt fences can trap a much higher percentage of suspended sediments than straw bales, though silt fence passes the sediment-laden water slower. Silt fences are preferable to straw barriers in many cases because of their durability and potential cost savings. While the failure rate of silt fences is lower than that of straw barriers, many instances have been observed where silt fences are improperly installed, inviting failure and sediment loss. The installation methods outlined here can improve performance and reduce failures.

As noted, flow rate through silt fence is significantly lower than the flow rate for straw bale barriers. This creates more ponding and hence more time for sediment to fall out. Table 3.05-A demonstrates these relationships.

Both woven and non-woven synthetic fabrics are commercially available. The woven fabrics generally display higher strength than the non-woven fabrics and, in most cases, do not require any additional reinforcement. When tested under acid and alkaline water conditions, most of the woven fabrics increase in strength, while the reactions of non-woven fabrics to these conditions are variable. The same is true of testing under extensive ultraviolet radiation. Permeability rates vary regardless of fabric type. While all of the fabrics demonstrate very high filtering efficiencies for sandy sediments, there is considerable variation among both woven and non-woven fabrics when filtering the finer silt and clay particles.

Design Criteria

1. No formal design is required. As with straw bale barriers, an effort should be made to locate silt fence at least 5 feet to 7 feet beyond the base of disturbed slopes with grades greater than 7%.

TABLE 3.05-A

TYPICAL FLOW RATES AND FILTERING EFFICIENCIES OF PERIMETER CONTROL

Material	Flow Rate (gal./sq.ft./min)	Filter Efficiency(%)
Straw	5.6	67
Synthetic Fabric	0.3	97

Source: VHTRC

2. The use of silt fences, because they have such a low permeability, is limited to situations in which only sheet or overland flows are expected and where concentrated flows originate from drainage areas of 1 acre or less.

3. Field experience has demonstrated that, in many instances, silt fence is installed too short (less than 16 inches above ground elevation). The short fence is subject to breaching during even small storm events and will require maintenance "clean outs" more often. Properly supported silt fence which stands 24 to 34 inches above the existing grade tends to promote more effective sediment control.

Construction Specifications

Materials

1. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester or ethylene yarn and shall be certified by the manufacturer or supplier as conforming to the requirements noted in Table 3.05-B.

2. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0° F to 120° F.

3. If wooden stakes are utilized for silt fence construction, they must have a diameter of 2 inches when oak is used and 4 inches when pine is used. Wooden stakes must have a minimum length of 5 feet.

TABLE 3.05-B

PHYSICAL PROPERTIES OF FILTER FABRIC IN SILT FENCE

Physical Property	Test	Requirements
Filtering Efficiency	ASTM 5141	75% (minimum)
Tensile Strength at 20% (max.) Elongation*	VTM-52	Extra Strength - 50 lbs./linear inch (minimum) Standard Strength - 30 lbs./linear inch (minimum)
Flow Rate	ASTM 5141	0.2 gal./sq.ft./ minute (minimum)
Ultraviolet Radiation Stability %	ASTM-G-26	90% (minimum)

* Requirements reduced by 50% after six months of installation.

Source: VHTRC

4. If steel posts (standard "U" or "T" section) are utilized for silt fence construction, they must have a minimum weight of 1.33 pounds per linear foot and shall have a minimum length of 5 feet.

5. Wire fence reinforcement for silt fences using standard-strength filter cloth shall be a minimum of 14 gauge and shall have a maximum mesh spacing of 6 inches.

Installation

1. The height of a silt fence shall be a minimum of 16 inches above the original ground surface and shall not exceed 34 inches above ground elevation.

2. The filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter cloth shall be spliced together only at a support post, with a minimum 6-inch overlap, and securely sealed.

3. A trench shall be excavated approximately 4-inches wide and 4-inches deep on the upslope side of the proposed location of the measure.

4. When wire support is used, standard-strength filter cloth may be used. Posts for this type of installation shall be placed a maximum of 10-feet apart (see Plate 3.05-1). The wire mesh fence must be fastened securely to the upslope side of the posts using heavy duty wire staples at least one inch long, tie wires or hog rings. The wire shall extend into the trench a minimum of two inches and shall not extend more than 34 inches above the original ground surface. The standard-strength fabric shall be stapled or wired to the wire fence, and 8 inches of the fabric shall be extended into the trench. The fabric shall not be stapled to existing trees.

5. When wire support is not used, extra-strength filter cloth shall be used. Posts for this type of fabric shall be placed a maximum of 6-feet apart (see Plate 3.05-2). The filter fabric shall be fastened securely to the upslope side of the posts using one inch long (minimum) heavy-duty wire staples or tie wires and eight inches of the fabric shall be extended into the trench. The fabric shall not be stapled to existing trees. This method of installation has been found to be more commonplace than #4.

6. If a silt fence is to be constructed across a ditch line or swale, the measure must be of sufficient length to eliminate endflow, and the plan configuration shall resemble an arc or horseshoe with the ends oriented upslope (see Plate 3.05-2). Extra-strength filter fabric shall be used for this application with a maximum 3-foot spacing of posts.

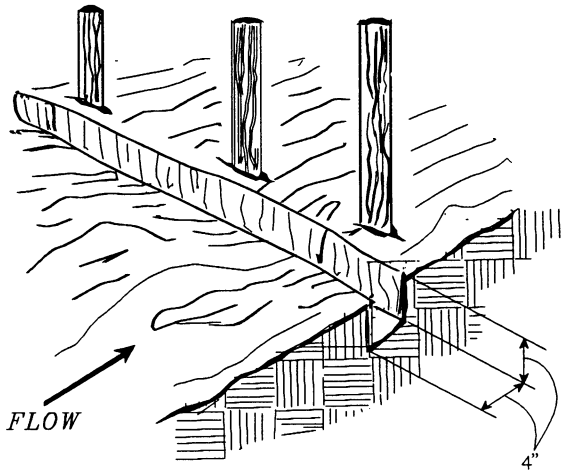
   All other installation requirements noted in #5 apply.

7. The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric.

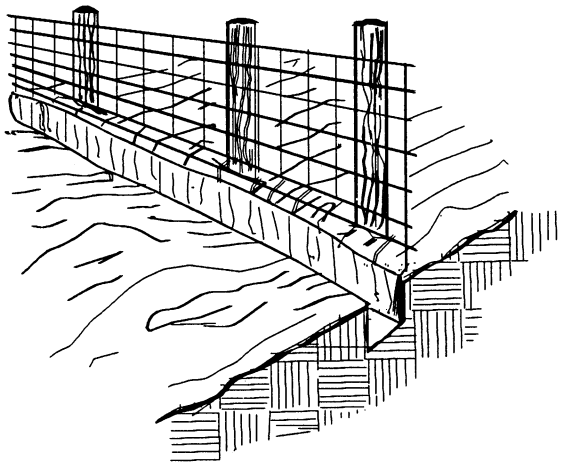
8. Silt fences shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

CONSTRUCTION OF A SILT FENCE (WITH WIRE SUPPORT)

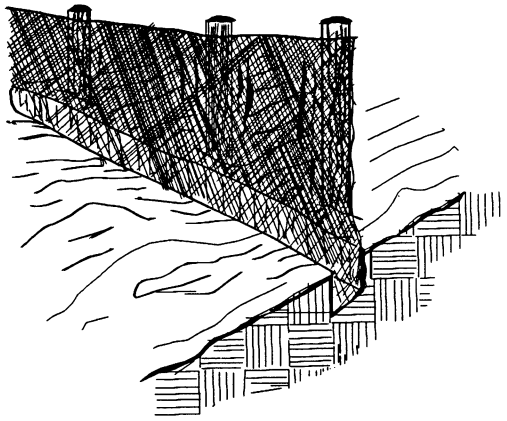
1. SET POSTS AND EXCAVATE A 4"X4" TRENCH UPSLOPE ALONG THE LINE OF POSTS.



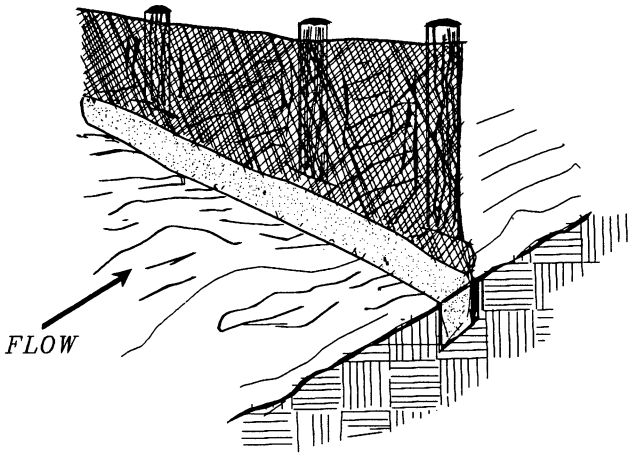
2. STAPLE WIRE FENCING TO THE POSTS.



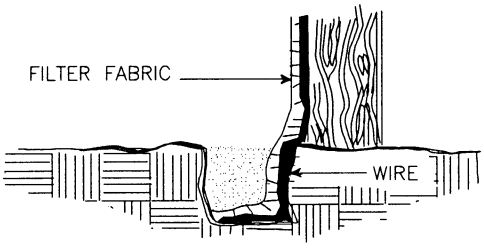
3. ATTACH THE FILTER FABRIC TO THE WIRE FENCE AND EXTEND IT INTO THE TRENCH.



4. BACKFILL AND COMPACT THE EXCAVATED SOIL.



EXTENSION OF FABRIC AND WIRE INTO THE TRENCH.

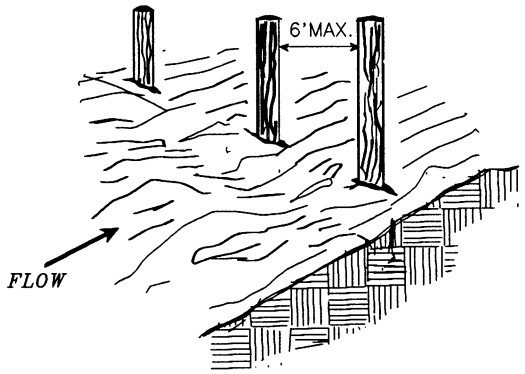


Source: Adapted from Installation of Straw and Fabric Filter Barriers for Sediment Control, Sherwood and Wyant

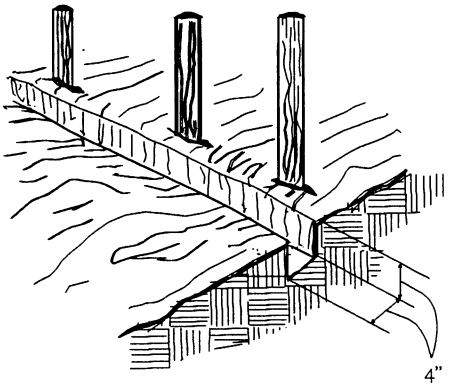
Plate 3.05-1

CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)

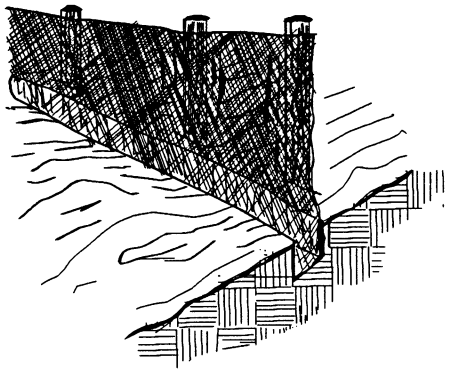
1. SET THE STAKES.



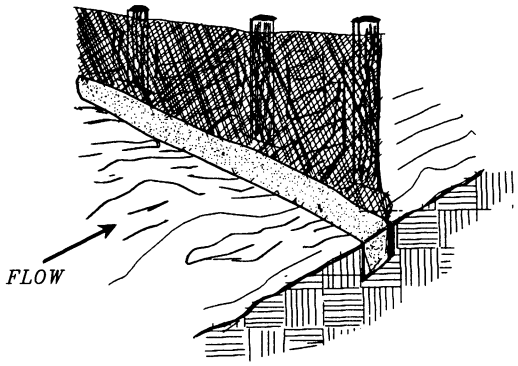
2. EXCAVATE A 4"X 4" TRENCH UPSLOPE ALONG THE LINE OF STAKES.



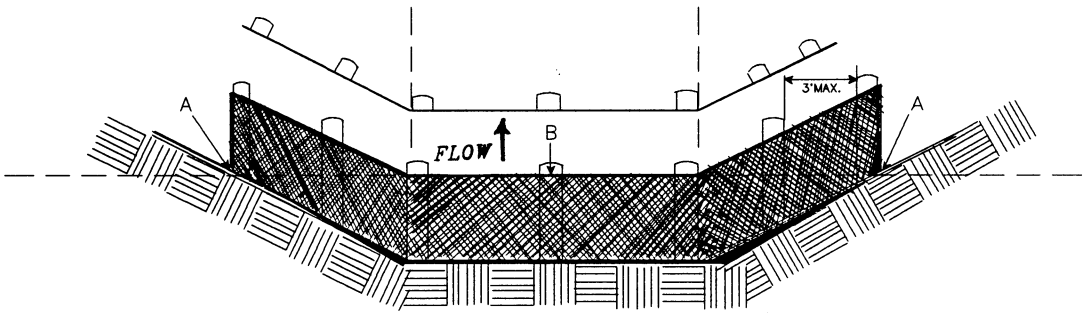
3. STAPLE FILTER MATERIAL TO STAKES AND EXTEND IT INTO THE TRENCH.



4. BACKFILL AND COMPACT THE EXCAVATED SOIL.



SHEET FLOW INSTALLATION
(PERSPECTIVE VIEW)



POINTS A SHOULD BE HIGHER THAN POINT B.

DRAINAGEWAY INSTALLATION
(FRONT ELEVATION)

Source: Adapted from Installation of Straw and Fabric Filter Barriers for Sediment Control, Sherwood and Wyant

Plate 3.05-2

Maintenance

1. Silt fences shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

2. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting.

3. Should the fabric on a silt fence decompose or become ineffective prior to the end of the expected usable life and the barrier still be necessary, the fabric shall be replaced promptly.

4. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.

5. Any sediment deposits remaining in place after the silt fence is no longer required shall be dressed to conform with the existing grade, prepared and seeded.